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eggs, and after such an interval of time could so accurately describe them, is entitled to the fullest credence in other details of the story, and I have no doubt of its substantial accuracy, in spite of its surprising nature.

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BOTANICAL NOTES FROM TUCSON.

BY JOS. F. JAMES.[1]

It is not very many years since the Territories of Arizona and New Mexico were regarded as the most forbidding countries in the world. Every one who went there carried his life in his hand, and if he escaped the fierce Apaches and returned home with his scalp and a whole skin, he was among the favored of mortals. Within the past five years much of this has changed, and the civilization brought about by the advent of railroads and the influx of determined miners, has been remarkable. A sojourn of some weeks in Arizona, gave me an opportunity to see some of the life of that quarter, and in this paper I purpose speaking of some things to be seen and found there.

The city of Tucson is the largest and most important settlement in Arizona. It is essentially Mexican ; settled as long ago as the end of the seventeenth century, it is one of the oldest towns in our country, and from its foundation to the present time, it has continued to be the center of the trade of the Territory. Situated in the midst of the mining regions, it furnishes supplies to mines on the north, east and south, and for the State of Sonora especially, is a depot of supplies. It is estimated that at certain seasons of the year the trade between Tucson and Sonora amounts to as much as a million dollars per month, the imports to the United States consisting of fruits, tobacco and whisky, and the exports of calicoes and other dry goods. These are carried for a distance of 300 or 400 miles on the backs of mules through passes in the mountains, and on account of the extreme duties into Mexico, much smuggling is constantly going on.

The streets of Tucson are narrow and unpaved ; many of them are a foot deep in finely powdered dust, and a sudden gust of wind, such as frequently arises, sweeping along the ground, raises a whirling cloud so thick that it is impossible to see across the street. All of the houses are built of "adobe," the Mexican name for sun-dried mud bricks, are generally but one story high, and have flat roofs. This kind of a house, with walls often two feet in thickness, is said to be much cooler in summer and warmer in winter than any other, and the thickness of the walls ought surely to keep out both heat and cold. To keep out the heat, however, is a much more important consideration than the cold, in a climate where the mercury often rises to 120° in the shade, and sometimes to 125°. In the summer the heat is something fearful to think of, but the air is so dry and so pure, that a degree of heat unbearable in our climate, can be easily endured in that one. During the summer many of the people take their cots into the yard, on to the sidewalk, or on the house tops, and sleep with the sky for a roof. In Yuma it is a common sight to see, early in the morning, people getting up and making their toilets in the open air.

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[1] Custodian Cincinnati Soc. Nat. Hist.

The bricks of the houses are about twenty inches long, eight inches wide and three inches thick. They are fastened together with a mortar made of earth mixed with water, the sidewalk often being dug up to furnish the principal ingredient. The houses are built in the form of a square or oblong, with a court in the center, thus allowing a free circulation of air and making the house much cooler. The better class have a covered porch, or "remada," round the court, and here the people sit and work during the day, and sleep during the hot weather.

There are many curious sights to be seen in and about Tucson, curious at least to Eastern eyes, but it is not my intention to speak of them here. During a stay of some six weeks in the city, I collected the plants of the immediate vicinity, and it is to them I shall refer at present.

The commonest plant of all the country about Tucson is known locally as the mesquite. Under this general name there are included several very distinct trees, but with the same general habit, which are all grouped under the name of mesquite. Sometimes they are scattered singly over the desert; and sometimes they are clustered together in a dense thicket. The trees are low and scraggley, with the branches sweeping the ground on all sides. They have handsome acacia-like leaves, and long branches of bright yellow flowers, succeeded by the pods which serve some of the Indian tribes as food. Concealed by the leaves are myriads of thorns in all stages of growth, but all hard, sharp and tough. In attempting to penetrate this brush, a gentle tickling at the back of the neck makes you aware of something in store for you, and as you turn to investigate, a branch seizes you by the sleeve, and another is prepared to enter your eye. Something sticking in your flesh calls your attention in another direction, and you find a cactus has fastened itself to your pantaloons. Devoting your attention to it, you finally succeed in detaching one thorn from your leg, and stick ten in your fingers, transferring them from one hand to

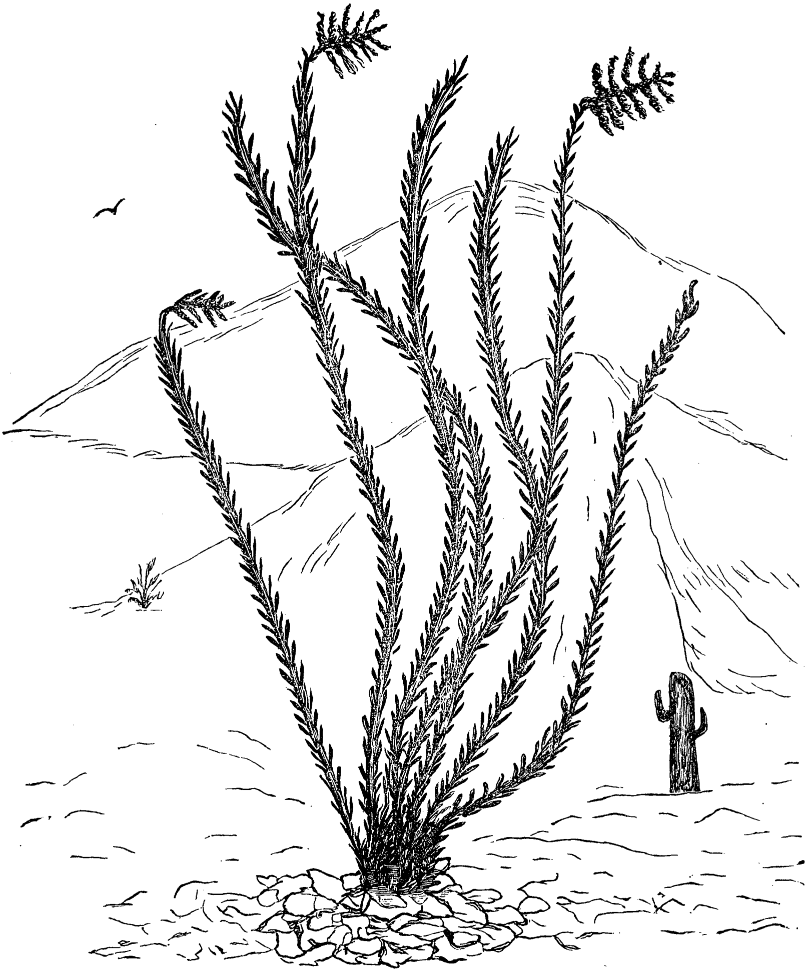

FIG. 1.—*Fouquiera splendens* Engelm.

the other with the greatest ease. Then your hat will be scraped off, your face will be scratched, and you will feel like saying something wicked. You think you see a bird sitting on a nest in one of the trees, and at the risk of your neck climb up to it, only to find it empty. When you reach the ground again, it is with a dozen thorns in your leg, more in your hands, and your face and neck bleeding from scratches. Should you try to sit down, you will find yourself located on a patch of ground already occupied by thousands of the sharpest kind of thorns; by this time you will probably have come to the conclusion that a mesquite patch is no place for a picnic and you vacate the premises.

Associated with the *Acacia greggii*, with yellow flowers in racemes, and long and crooked pods, is the *Acacia farnesiana*, a shrub from six to ten feet high, bearing great numbers of small yellow balls of flowers, which are very sweet scented. It is largely cultivated in China for the sake of the flowers, for out of them is made a delicious perfume. The creosote plant, *Larrea mexicana*, is very abundant on the deserts about Tucson, but a more worthless plant it would probably be difficult to find. Torrey says it is used externally for rheumatism; but no animal seems to feed upon it, and it is useless for fuel, for it can scarcely be made to burn.[1] It has been the subject of much discussion in California, and papers read before the Academy of Natural Sciences say that it produces such quantities of "lac dye," that a profitable business could be carried on by collecting and exporting it. As far as I have observed in examining a large number of bushes, a very small proportion only produces the material for the dye, and these in such small quantities as to make it hardly worth the trouble of gathering.

Still another very common and at the same time a very curious plant is the *Fouquiera splendens*, one of the Tamariscineæ, and known to the Mexicans as "ochotilla." It grows all over the deserts of Arizona and among the rocks on the mountains. The branches are long and whip-like, armed with innumerable sharp, curved thorns an inch or more long. The flowers are of a bright scarlet, and form racemes at the ends of the branches. The leaves are three-parted, sessile, and generally appear after the flowers have gone. It is used very extensively by the Mexicans for fences, and oftentimes one sees a fence of this plant, the pieces stuck into the ground and bound together with raw hide and bunches of the bright scarlet flowers at the top of the stalk. The plant is certainly one of the most striking of all found on the deserts of Arizona.

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[1] Torrey's Report in Emory's Reconnoissance of N. Mex. and Cal., p. 138.

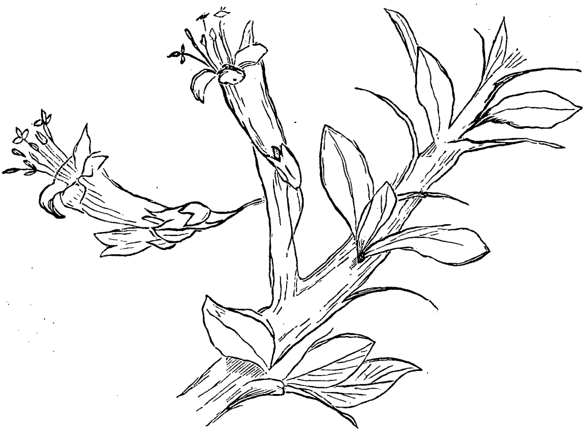

FIG. 2.—Flowers of *Fouquiera* (*spinosa*) *splendens* Eng

Another form is the "Palo erde" of the Mexicans. It is the *Parkinsonia torreyana*, one of the Leguminosæ. It grows to be some fifteen or twenty feet high, and all the branches are of a light-green color. The flowers are of a bright yellow, in long racemes, and quite sweet-scented. Those trees noticed on the Colorado desert were surrounded by swarms of bees, apparently finding excellent food among the blossoms. When in flower, no leaves are to be seen, and when these come out they are very small and inconspicuous.

The cacti form a most conspicuous feature of mountain and desert. By far the most conspicuous and remarkable form is the *Cereus giganteus*, locally known as the "saguara" cactus. It was first brought to the notice of the scientific world by Emory's Expedition from Fort Leavenworth to San Diego, in 1848, and in his report was given its present name. It is an upright fluted or ribbed pillar, each rib covered from bottom to top with a mass of sharp, straight thorns. At the top of the stem are the long tubular white flowers, with the petals just peeping from the calyx, and with the interior filled with an innumerable mass of stamens. After the fruit is formed the flower, in drying, has the pleasant odor of Calycanthus. When ripe the fruit splits open at the top, displaying the bright red scarlet of the interior, dotted with the numerous small black seeds. It is much relished by the Mexicans, but to me has a mucilaginous and sweet, but insipid taste.

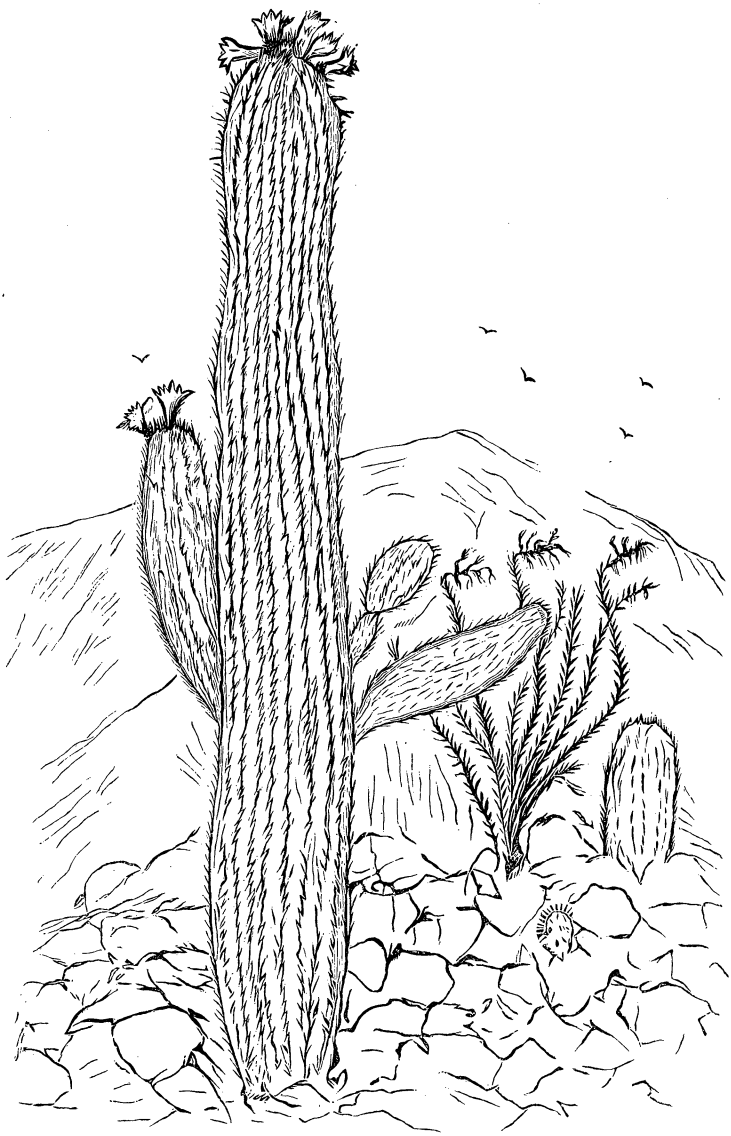

FIG. 3.—*Cereus giganteus* Engelm.

Birds are very fond of it and often secure it before any one else can get it. The bright red color of the inside of the fruit can be seen a long way, and doubtless serves to attract birds who can thus disseminate the seeds.

There is no more striking and conspicuous form of vegetation than this *Cereus giganteus.* It often grows to the height of thirty feet, straight as an arrow and of nearly the same size from bottom to top. The internal framework is made up of a number of hard woody cylinders, the spaces between being filled up by pithy matter; sometimes it is branched, but in a stiff and ungraceful manner, the branches jutting out almost at right angles and then turning and ascending parallel to the parent stem. Sitting on the rocks near some of these plants, when the wind was blowing strongly, the sound of it passing between the spines resembled strikingly the soughing of the wind through the branches of a pine tree; and shutting the eyes it required but little imagination to be transported to a northern pine forest, listening to the wind blowing through the branches. It is strange that the action of the wind in two such different localities as the hot deserts of the South and the cool mountains of the North; and playing upon two such different types of vegetation as a cactus and a pine tree, should produce sounds so similar to each other.

Another species of the family is one commonly called the "nigger-head" or "barrel" cactus, a Mammalaria. This often grows four feet high, sometimes only half as much, and almost globular in shape. It has many ribs converging to the top, and each bears innumerable clusters of spines. The lower ones are long, straight and horizontal; some of the central ones stand upright and the largest in each cluster is curved over so as to form a sharp hook. These are very tough, and while the crooked ones serve the Indians for fish hooks, the straight ones are used as needles. The flowers of this species are generally red. A much smaller species of this form, also a Mammalaria, is very common among the rocks on the mountains near the city. The spines are black and very small, but sharp. Still another species *(Opuntia arborescens)* grows sometimes to be almost a tree, and is covered with a mass of the most awful looking, and feeling thorns. These seem to be covered with a sort of sheath, easily removed, and easily sticking into one's fingers. The thorns are sharp enough and long enough to go through pantaloons and boot top, and stick viciously into the skin. The Mexicans call this the "ochoya" cactus, and often finding a straight plant and about the right size, will clean off the thorns, and then by much labor clean out the pith from the stem, leaving a stick which is full of holes of all sizes, and which makes a useful and ornamental cane. Then the common prickly pear (Opuntia) forms immense patches, covering acres of ground, and sometimes forming hedges eight and ten feet high. The fruit is known as a "tuni," and is eaten by the Indians and Mexicans. It is of a very mucilaginous nature, sweet and insipid, but not very palatable to ordinary tastes.

It is characteristic of many of the plants of the desert to be provided with thorns, and where there are many thorns there is relatively a small amount of leaf surface. The immense number of cacti are by no means the only spine-bearing plants, and one of the most remarkable, outside of that family, is the *Holacantha emoryi.* This grows in the dryest and most barren spots of the desert, and forms a large mass of what appears to be nearly all branches and thorns, but it is intermixed with innumerable clusters of small yellow flowers. The small leaves are not apparent when the plant is in bloom, but come out soon afterward. Another plant of a peculiar character, common at Tombstone, seventy-five miles south-east of Tucson, is the *Nolina texana.* It has a long branching spike of white flowers, intermixed with linear, sharp-pointed leaves. At the base of the stem great numbers of long sharp leaves spring in all directions, some being eighteen inches or more long, and presenting a formidable appearance. It abounds in the dryest localities.

Besides the desert itself, with its peculiar flora, there are one or two other places in the vicinity of Tucson which are excellent for plant gathering. One is in a patch of low ground where a small stream has been dammed up forming a pond which serves to keep the ground in the vicinity quite moist. Here some few familiar forms are to be found, mixed with others entirely unfamiliar. Among the former, growing very luxuriantly, is the *Ampelopsis quinquefolia*, apparently the same as the eastern form, *Cephalanthus occidentalis*, *Apocynum cannabinum*, *Samolus valerandi* var. *americanus*, *Medicago sativa*, *Scirpus olneyi*, similar to *S. pungens*, and *Juncus balticus;* a native of Europe as well as of the Eastern United States. Among the unfamiliar forms is *Amorpha californica*, a small shrub with pinnate leaves and long racemes of purple flowers, very similar in appearance to *A. fruti-*

cosa. Another is the *Antirrhinum maurandioides*, a pretty climbing plant, with large blue flowers and sagittate leaves. It is very common, and climbs over all plants within its reach. The *Cuscuta californica* grows in such profusion as to completely overwhelm many other plants, and gives a peculiar yellowish appearance to all, while *Convolvulus occidentalis*, with large white flowers, covers large patches of ground with its trailing stems. *Castilleia linariæfolia* is very common in patches, and is tall and slender, with bright red flowers and linear leaves.

Almost the only other locality in the neighborhood of Tucson favorable for the growth of plants, is along the Santa Cruz river, a small stream which rises to the south of the city, flows past it, sinks into the ground some ten miles on the other side, rises again to the surface, and finally empties into the Gila river. For some distance along its banks the Mexican women use it as a wash tub, and along a special part of it can be seen, at all times, numbers of women washing clothes. They beat them on the stones and wear out the clothes as much as take out the dirt. Near the stream, climbing extensively over the bushes, grows *Clematis drummondii*, with three-parted leaves and large clusters of white flowers. Here also is found the *Philabertia cynanchoides*, one of the Asclepiadaceæ. It has extensively twining stems, arrow-shaped leaves and small clusters of greenish yellow flowers. A mile further up the stream we come to where it has been run into a sort of canal to run a mill, and along the side of the mountain, below the canal, where the ground is always moist, is a good growth of vegetation. Here is found *Aster pauciflorus*, with long linear leaves, and flowers with blue rays in branched corymbs. The larger growth consists principally of willows and poplars, *Populus fremonti*, var. *Wislizeni*, being the most common. The *Tessaria borealis* is another tree with the aspect of a Baccharis and a willow. It has small, linear, silky leaves and rose-colored flowers in dense clusters. The down of the seeds is used extensively by the birds for lining their nests.

Along the banks of the stream is a little Hydrocotyle, a Ligusticum, *Eleocharis palustris* and other plants loving damp localities, and in the water *Ceratophyllum demersum*, *Potamogeton natans* and *P. pectinatus*. At the other side of the city, but still within the influence of the river, grows *Tribulus grandiflorus*, one of the Zygophyllaceæ. It has large, beautiful, orange-colored flowers, with pinnate leaves, hairy and procumbent stem, and is one of the most attractive flowers of the region. The *Juglans rupestris* grows sparingly along the roads, and a tall Acacia *(A. hirta ?)* with a straight branching stem, round bunches of white flowers and finely pinnate leaves, is quite common.

These are some of the plants which, in a short period of time, and at an unfavorable season of the year, can be found in the vicinity of this, one of the oldest settlements of America. I have by no means noticed all the species collected there, for I have not yet had an opportunity to identify them, and there are no doubt many more species to be found by one spending a year at the place. I have been informed by those who know, that during the summer rains many plants spring up, bloom for a short time and disappear for the remainder of the year. Among the species to be found here are doubtless many which are Mexican forms; but this is nothing strange, for the whole of the flora of Southern California, Arizona and New Mexico belongs to the Mexican region. The climate and geographical features of all are very similar; dry and barren plateaus and mountains, where little rain ever falls and where the heat in summer is very intense; with few streams to water the soil, and these few having an uncertain existence, the beds being nearly dry the greater part of the year. Cloud bursts, waterspouts and sand storms are characteristic of the whole country, and any division which can be made will place Upper Mexico, Arizona, New Mexico and Southern California in the same zoölogical and botanical region.

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EDITORS' TABLE.

EDITORS: A. S. PACKARD, JR., AND E. D. COPE.

—— The scope and aim of the biological sciences are embraced by their two great primary divisions, phylogeny and physiology. Phylogeny states the history and manner of the creation of beings possessed of life, while physiology exposes the forces which are active in creation and other functions of life, and sets forth their *modus operandi.*

All biological research contributes to one or the other of these departments. There are two branches essential to the development of phylogeny, viz: embryology and palæontology. The essential preliminary to both of these sciences is, of course,